

PRELIMINARY NOTE ON THE OCCURRENCE OF A  
PLACENTAL CONNECTION IN *PERAMELES OBE-*  
*SULA* AND ON THE FETAL MEMBRANES OF  
CERTAIN MACROPODS.

BY JAS. P. HILL, DEMONSTRATOR OF BIOLOGY, IN THE UNIVERSITY  
OF SYDNEY.

(Plate XLIX.)

Some little time ago there came into my hands, through the kindness of Mr. A. M. Lea, a female short-nosed Bandicoot, *Perameles obesula*, which proved, on examination, to be pregnant. Two embryos were found in the left uterus, and one, the largest of the three, in the right. This latter embryo measured 8.75 mm. from end to end of the curved body.

On opening the uteri it was found to be impossible to remove the embryos without tearing the fetal membranes, and so two of them were preserved enclosed in their membranes and attached to portions of the uterine walls.

Recently I have had the opportunity of examining these embryos in some detail, both macroscopically and microscopically in serial sections, with the result that a true allantoic placenta was discovered.

The fetal membranes need not be specially considered in this note, since they have essentially the same general arrangement as those of *Phascolarctus* and *Aepyprymnus*, recently described by Prof. R. Semon.\* As in these forms the embryo is sunk into the yolk sac, and is partially surrounded by the invaginated upper portion of the yolk sac wall consisting of splanchnopleure (splanchnic mesoderm and entoderm), and distinguished by Semon as the "inneres Blatt." This inner leaf does not, however, so completely surround the embryo in *Perameles* as in *Macropus*,

---

\* Zoologische Forschungsreisen in Australien. Zweiter Band, Erste Lieferung. Monotremen und Marsupialier, von R. Semon.

*Aepyprymnus* or *Phascolarctus*, and thus the portion of the serous membrane consisting of ectoderm and somatic mesoderm and limiting the extra-embryonic cœlom externally forms a discoidal area of considerable size. With this discoidal area of the serous membrane the allantois fuses, and over it the placental connection is established.

The allantois is well developed and large, and provided with an abundant blood supply. It consists of a long and somewhat flattened stalk, and a terminal expanded and much flattened vesicular portion. The allantoic stalk leaves the embryo immediately behind the yolk stalk, bends round the right side of the embryo, and extending through the extra-embryonic cœlom expands at its distal end to form the flattened vesicular portion which spreads over the discoidal area of the serous membrane above mentioned. In the stalk the allantoic cavity is reduced to a narrow compressed canal, appearing in sections as a mere slit, lined by greatly flattened entodermal cells. This narrow canal opens distally into the cavity of the vesicular portion of the allantois, which is likewise lined by a thin layer of flattened entoderm. The cavity of the vesicular portion is greatly compressed by the approximation of the allantoic walls, and in sections appears as a long fissure of somewhat varying breadth. One can thus readily distinguish two surfaces in this portion of the allantois—an inner or cœlomic surface and an outer or placental surface.

The mesoderm of the outer surface of the allantois is fused with the mesoderm of the serous membrane so that one can no longer distinguish between the mesenchyme of the allantois and that of the serous membrane, and not only so, one can no longer make out the ectoderm of the serous membrane as a distinct and independent layer, the mesenchyme on the outer aspect of the allantoic cavity apparently standing in direct connection with the uterine mucosa. It seems more probable from my preparations that the ectoderm of the serous membrane has fused with the uterine mucosa than that it has disappeared in its entirety. However, my observations on this point are by no means complete, and the

question as to the fate of the ectoderm may be left undecided for the present, especially since I have within the last few days received from Mr. A. G. Hamilton a pregnant uterus of *P. obesula* containing an unattached blastodermic vesicle. The examination of this material will, I trust, throw light on the point in question, and also on certain other points in connection with the structure of the wall of the pregnant uterus.

As a consequence of this union of foetal and maternal tissues the uterine wall exhibits certain structural modifications. The layer of columnar epithelium which forms the inner lining of the non-pregnant uterus can no longer be distinguished. It has degenerated apparently over the whole extent of the inner surface of the uterus. Also there are present a short distance below the surface of the mucosa, groups of large oval or rounded nuclei, which, in the region of the placental connection are larger and stain much deeper than in the remaining portions of the uterus. These groups of nuclei are probably derived by proliferation from the lining epithelium of the uterus. The uterine glands are large and well developed, their epithelial lining showing no signs of degeneration.

The placenta is supplied with foetal blood by the allantoic vessels, which consist of a large vein, on either side of which is a small artery. These three vessels extend unbranched in the allantoic stalk. At its distal end the arteries branch out on the inner or coelomic surface of the vesicular portion of the allantois, while the allantoic vein is formed by the union of two main factors which accompany the main arterial vessels. The latter branch in a dichotomous manner on the inner surface of the allantois, each arterial branch being accompanied by a venous trunk as is characteristically found in the allantois. These vessels ramifying on the inner surface of the vesicular portion of the allantois can be traced round into the mesenchyme of the outer surface, and there they break up into capillaries. The capillaries become closely applied to the surface of the uterine mucosa and form with it a somewhat irregular interlocking system, since they dip down into the substance of the mucosa to form short villous

processes. The uterine mucosa is very richly supplied with blood, the maternal capillaries forming a network on and near the surface of the mucosa, so that foetal and maternal blood are thus brought into very close relation, readily allowing of transfusion. The allantois of *Perameles* is thus functional both as a respiratory organ and as an organ of nutrition—a distinct advance upon the (according to Semon) purely respiratory function of the organ in *Phascolarctus*.

In view of this discovery of a true allantoic placenta of the discoidal type in *Perameles*, the Marsupialia as a class can no longer be included among the Aplacentalia and the, up to this, universally recognised character of Marsupials “no allantoic placenta” likewise no longer holds good.

The Macropod embryos available for examination consist of intra-uterine embryos of *Macropus parma*, *M. ruficollis*, *M. robustus*, and *M. major*. In this note it need only be mentioned that I am able to confirm Semon's belief that in the arrangement of their foetal membranes Macropods would be found to conform to his first type, as exemplified by *Aepyprymnus*, in which the allantois never comes into any connection with the serous membrane.

I desire to tender my sincere thanks to Prof. J. T. Wilson for many valuable suggestions during the course of my work.

---

#### EXPLANATION OF PLATE.

Diagram of the foetal membranes of *Perameles obesula*.

The ectoderm is indicated by a thin line, the mesoderm by a thick line, and the entoderm by a dotted line.

#### Reference letters.

*all.c.*, allantoic cavity; *all.st.*, allantoic stalk; *amn.*, amnion; *cæ.*, extra-embryonic cælom; *mes.*, mesenchyme of outer surface of allantois fused with mesenchyme of serous membrane; *pro.*, prokalymma of Semon; *s. t.*, sinus terminalis; *ut.*, uterine wall; *y.s.*, yolk sac; *y.s.w.*, invaginated portion of yolk sac wall.